ABS ACTA BIOLOGICA SIBIRICA
A journal on the biodiversity of Siberia and the adjacent lands

Acta Biologica Sibirica 6: 369–374 (2020)
doi: 10.3897/abs.6.e53528
https://abs.pensoft.net

RESEARCH ARTICLE

First records of the *Dendroxena quadrimaculata* (Scopoli, 1771) (Coleoptera, Silphidae) in Tyumen region and possible reasons for its range expansion in Western Siberia

Vitaly A. Stolbov[1], Elena V. Sergeeva[2]

1 *Tyumen State University, 6 Volodarskogo St, Tyumen 625003, Russia.*
2 *Tobolsk Complex Research Station, Ural Branch of the Russian Academy of Science, 15 Acad. Yu. Osipova St, Tobolsk 626152, Russia.*

Corresponding author: Vitaly Stolbov (vitusstgu@mail.ru)

Academic editor: A. Matsyura | Received 10 March 2020 | Accepted 12 April 2020 | Published 6 October 2020

http://zoobank.org/EA17C825-6EDA-47A7-81D2-C5E9322BDED2

Citation: Stolbov VA, Sergeeva EV (2020) First records of the *Dendroxena quadrimaculata* (Scopoli, 1771) (Coleoptera, Silphidae) in Tyumen region and possible reasons for its range expansion in Western Siberia. Acta Biologica Sibirica 6: 369–374. https://doi.org/10.3897/abs.6.e53528

Abstract

The paper presents data on the first records of *Dendroxena quadrimaculata* (Scopoli, 1771) in the Tyumen region. *D. quadrimaculata* is distributed in the European part of Russia, Caucasus and south of Siberia. This species was not previously recorded in the Tyumen region, but within two years (2018–2019), it spread throughout the region. We considered the possible reasons for its range expansion in Western Siberia.

Keywords

Dendroxena quadrimaculata, Western Siberia, new records, climate change

Introduction

Dendroxena quadrimaculata (Scopoli, 1771) is a Western Palearctic species of Silphidae family and distributed in Central and Southern Europe, Turkey, Iran and Kazakhstan (Růžička 2015), acclimatized in Northern Africa (Algeria) and Northern America (Nikolaev and Kozminykh 2002). In Russia, this species is widespread in the

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European part and Caucasus. In the Middle Urals it was recorded in the Perm Krai and Sverdlovsk region (Redikortsev 1908; Kozminykh 1997). In the south of Siberia this species were found in the Krasnoyarsk Krai (Loshchev 2015), Kemerovo Oblast (Efimov 2008) and the Baikal region (Berlov 1977; Pleshanov and Takhteev 2008).

D. quadrimaculata is nemoral forest species. Its imagoes and larvae feed mainly on butterfly caterpillars (Nikolaev and Kozminykh 2002) and therefore this species is used in forest pest control (Ivantsova and Vostrikova 2015). In a number of regions (Vladimir, Kaliningrad, Tver, Tula regions, and Republic of Mordovia), this species is rare and listed in regional Red Data Books.

Earlier, the species was not recorded in the Tyumen region, but within two years (2018–2019), it spread throughout the region from the forest-steppe zone to the southern taiga, where it was found in mixed and birch forests.

Material and methods

Below is the detailed information about new records in the Tyumen region.

Family Silphidae Latreille, 1806
Subfamily Silphinae Latreille, 1806

***Dendroxena quadrimaculata* (Scopoli, 1771)**

Material. Russia – Tyumen region • 1♂, 1♀ (in copuli); Nizhnetavdinsky district, vicinity of biological station of the Tyumen State University "Lake Kuchak";

Figure 1. Imago (Tobolsky distr.).

Figure 2. Mixed forest in the south taiga (Tobolsky distr.).

57°20'44"N, 66°04'05"E; 26 Jun 2018; A. Nikolaychuk leg.; mixed pine-birch forest, on sandy road • 1♂, 1♀ (in copuli); same locality; 57°20'49"N, 66°03'01"E; 28 Jun 2018; students leg.; mixed pine-birch forest, on sandy road • 1 ex.; Tyumen city, Patrusheva village; 57°05'55"N, 65°33'35"E; 29 May 2019; A. Afonin leg; in garden • 1 ex.; Tobolsky district, vicinity of Verkhnie Aremzyany village; 58°32'93"N, 68°55'04"E; 28 May 2019; E. Sergeeva leg.; mixed birch-aspen-linden forest • 1 ex.; Yarkovsky district, vicinity of lake Petigul'; 57°38'60"N, 68°79'41"E; 19 Jun 2019; T. Khlyzova leg.; birch-aspen forest • 27 ex.; Kazansky district, vicinity of Novoalexandrovka village, shore of Lake Siverga; 55°40'06"N, 67°46'86"E; 4–6 Jun 2019; E. Sergeeva leg; birch forest.

Figure 3. Mixed forest in the subtaiga (Yarkovsky distr.).

Figure 4. Birch forest in forest-steppe zone (Kazansky distr.).

Discussion

It is known (Alekseev 2010) that *D. quadrimaculata* is characterized by natural fluctuations in abundance, which correlate with mass reproduction of its main food object – leaf-eating caterpillars. Therefore, in our opinion, one of the main reasons for species range expansion in Western Siberia is its irruptions and the spread of gypsy moth *Lymantria dispar* (L.) to the north. Since the end of the XX century, it spread widely in the forest zone of Western Siberia, where its foci were localized before only in the forest-steppe zone (Gninenko 2000; Titkina et al. 2013; Yasyukevich et al. 2013). According to our observations, *L. dispar* reached the highest numbers in 2017–2018. Also, in recent years, another species trophically associated with *L. dispar* – *Calosoma sycophanta* (L.) has distributed to the north in Western Siberia (Stolbov et al. 2018).

Another possible factors caused the range expansion of the *D. quadrimaculata* could be the global climate change and adaptation of this species to new habitat conditions. Thus, in recent years, a number of southern invertebrates, new to the region, are actively spreading to the north (Stolbov et al. 2016; Sergeeva and Kapitonov 2017).

The expansion of *D. quadrimaculata* in the Tyumen region probably occurs from the territory of Kazakhstan (North Kazakhstan region), that is evidenced by the numerous specimen collections of this species in the border areas.

Thus, the appearance of *D. quadrimaculata* in Tyumen region is apparently associated with three main factors: climate change, irruptions and the range expansion of the main fodder object.

Acknowledgements

The work was carried out within the framework of the state research and technology theme "Biodiversity of wetland ecosystems in the South of Western Siberia" (№ 0408-2019-0005; E.V. Sergeeva).

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